CLAIMS

1. An automated system for treatment of a plurality of chemical or biological samples attached to solid supports comprising:

a sample/collection container;

a variable-speed centrifuge having a chamber and a rotor with a plurality of loading positions for retaining a plurality of sample/collection containers;

at least one dispensing station disposed at least partially in the chamber for dispensing a treatment solution into the plurality of sample/collection containers; and

a computer control unit for controlling and monitoring each of the centrifuge and the at least one dispensing station.

2. The automated system of Claim 1, further comprising: a temperature control subsystem for controlling a temperature of the compounds;

wherein the computer control unit further controls the temperature control subsystem.

3. The automated system of Claim 2, wherein the temperature control subsystem comprises at least one heat lamp disposed outside of the chamber and a window is disposed in a side of the chamber to transmit heat from the at least one heat lamp into the chamber.

4. The automated system of Claim 3, wherein the temperature control subsystem includes a plurality of heat plates for receiving heat from the

at least one heat lamp and transferring the heat to each sample/collection container.

5. The automated system of Claim 4, wherein each heat plate comprises a thermally-conductive material for providing uniform heat diffusion.

6. The automated system of Claim 4, further comprising a temperature sensor in contact with at least one heat plate of the plurality of heat plates for sensing the temperature of the heat plate.

7. The automated system of Claim 6, wherein the temperature sensor provides a feedback signal for controlling operation of the at least one heat lamp.

8. The automated system of Claim 3, wherein the temperature control subsystem further comprises a plurality of heating elements attached to the chamber.

9. The automated system of Claim 1, further comprising:

a vacuum subsystem for reducing a pressure within the chamber;

wherein the computer control unit further controls the vacuum subsystem.

10. The automated system of Claim 9, wherein the vacuum subsystem comprises a plurality of pumps and a condenser for capturing vapors removed from the chamber.

11. The automated system of Claim 1, further comprising a gas supply subsystem for purging the chamber.

12. The automated system of Claim 1, wherein the sample/collection container is encoded with a unique identity and further comprising:

an identification system including a scanner for reading the unique identity of the sample/collection container;

wherein the computer control unit further controls the identification system.

13. The automated system of Claim 12, wherein the sample/collection container comprises an assembly of a sample container and a collection container, each container of the assembly having a separate unique identity.

14. The automated system of Claim 13, wherein the identification station includes a positioner for positioning the scanner for reading each separate unique identity of the assembly.

15. The automated system of Claim 12, wherein the unique identity is encoded in an optical bar code disposed on at least one surface of the sample/collection container and the scanner is a bar code scanner.

16. The automated system of Claim 12, wherein the unique identity is encoded in an RF tag disposed on or embedded in the sample/collection container and the scanner is an RF transmitter/receiver.

17. The automated system of Claim 1, wherein the sample/collection container comprises an assembly of a sample container and a collection container, each container have a plurality of wells formed therein, wherein the sample container has a plurality of drains connected to the wells for transferring, under centrifugal force, a solution from each well in the sample container into a corresponding well of the collection container, wherein the solid supports remain in the wells of the sample container.

18. The automated system of Claim 17, wherein the plurality of wells comprises 96 wells.

19. The automated system of Claim 17, wherein the solid supports are selected from the group consisting of loose beads, tubes, pins, crowns, disks, balls, cubes, blocks, and porous containers containing resin particles or beads.

20. The automated system of Claim 17, wherein each well in the sample container is configured as a column with a plurality of porous plugs disposed therein for retaining the solid support and a biological sample therebetween.

21. The automated system of Claim 1, wherein the sample/collection container comprises a plurality of wells, each well having a first inner diameter at an upper portion and a second inner diameter smaller than the first inner diameter at a lower portion, wherein the second inner diameter is smaller than

the solid support so that the solid support is retained in the well above the lower portion.

22. The automated system of Claim 1, wherein the variable-speed centrifuge operates at a first speed during cleavage and at a higher second speed during transfer and/or concentration of a cleaved sample.

23. The automated system of Claim 22, wherein the first speed is selected to minimize creep.

24. The automated system of Claim 23, wherein the first speed is on the order of 20 to 30 r.p.m.

25. The automated system of Claim 22, wherein the second speed is selected to reduce bumping.

26. The automated system of Claim 25, wherein the second speed is on the order of 800 r.p.m.

27. The automated system of Claim 1, wherein the at least one dispensing station comprises two dispensing stations for dispensing a first solution and a second solution.

28. The automated system of Claim 27, wherein the samples are synthesized chemical compounds and the first solution is trifluoroacetic acid (TFA).

29. The automated system of Claim 28, wherein the second solution is dichloromethane (DCM).

30. The automated system of Claim 27, wherein the samples are biological samples and the first and second solutions are selected from the group consisting of a detergent, buffering solution, deionized water, and eluting reagent.

31. The automated system of Claim 1, wherein the computer control unit comprises a PC and a control network.

32. The automated system of Claim 31, wherein the control network is a DeviceNet-based network.

33. The automated cleavage system of Claim 1, wherein the at least one dispensing station comprises:

a housing attached to the chamber;

a dispensing head extending from the housing into the chamber, the dispensing head having a plurality of dispensing tips extending therefrom and arrayed in a pattern corresponding to an array of wells in the sample/collection container;

a plurality of reservoirs for retaining a measured amount of treatment solution;

a plurality of tubes extending through the housing and the dispensing head, each tube having a first end and a second end, one tube corresponding

to each reservoir of the plurality of reservoirs, the first end being disposed adjacent to the reservoir and the second end connected to a corresponding tip of the plurality of tips; and

a pressure source for forcing treatment solution from the reservoirs through the tubes and out of the corresponding tip into a corresponding well of the sample/collection container.

34. The automated cleavage system of Claim 33, wherein the dispensing station includes means for raising and lowering the dispensing head to fill the sample/collection containers.

35. The automated cleavage system of Claim 34, wherein the dispensing head includes an alignment devices for aligning the wells of the sample/collection container with the plurality of tips.

36. The automated cleavage system of Claim 35, wherein the dispensing head includes an alignment sensor for detecting misalignment.

37. The automated cleavage system of Claim 33, wherein the housing forms a vacuum-tight seal with the chamber.

38. The automated cleavage system of Claim 1, further comprising a venting system for removing vapors generated during evaporation of the treatment solution.

39. An automated method for processing of samples on solid supports, the method comprising:

(a) loading each sample and solid support into a sample well of a plurality of wells in a sample/collection container with one sample and solid support combination per sample well;

(b) loading a plurality of sample/collection containers onto a rotor position on a centrifuge rotor within an openable centrifuge chamber;

(c) rotating the centrifuge rotor to position a first sample/collection container below a dispensing head having a plurality of dispensing tips, with one dispensing tip corresponding to each well of the plurality of wells.;

(d) dispensing a processing solution into the plurality of wells of the first sample/collection container;

(e) rotating the centrifuge rotor to position a second sample/collection container below the dispensing head;

(f) under computer control, dispensing the processing solution into the plurality of wells of the second sample/collection container;

(g) repeating steps (e) and (f) until all sample/collection containers of the plurality have received the processing solution;

(h) under computer control, rotating the centrifuge rotor to spin the plurality of sample/collection containers to complete the processing of the samples; and

(i) halting the centrifuge rotor after completion of the processing and unloading the sample/collection containers.

40. The method of Claim 39, further comprising, during step (h), heating the sample/collection containers with a heat source to enhance the processing of the samples.

41. The method of Claim 40, further comprising, prior to step (b), placing a heat plate at each rotor position for uniform distribution of heat from the heat source.

42. The method of Claim 40, further comprising detecting the temperature of at least one heat plate and providing feedback for control of the heat source.

43. The method of Claim 39, further comprising reducing a pressure within the centrifuge chamber using a plurality of vacuum pumps.

44. The method of Claim 39, wherein each sample/collection container has a unique identifier, the method further comprising after step (b), under computer control, reading the unique identifier and storing the unique identifier in a computer memory.

45. The method of Claim 44, wherein the unique identifier is a bar code disposed on the sample/collection container.

46. The method of Claim 39, wherein the wherein the sample/collection container comprises a separable assembly of a sample container and a collection container, each container have a plurality of wells

formed therein, wherein the sample container has a plurality of drains connected to the wells, the method further comprising, during step (h), transferring, under centrifugal force, a solution from each well in the sample container into a corresponding well of the collection container, wherein the solid supports remain in the wells of the sample container.

48. The method of Claim 47, wherein each well in the sample container is configured as a column with a plurality of porous plugs disposed therein for retaining the solid support and a biological sample therebetween.

49. The method of Claim 47, wherein the sample container and the collection container each have a unique identifier disposed thereon.

50. The method of Claim 39, wherein the solid supports are selected from the group consisting of loose beads, tubes, pins, crowns, disks, balls, cubes, blocks, and porous containers containing resin particles or beads.

51. The method of Claim 39, wherein the sample/collection container comprises a plurality of wells, each well having a first inner diameter at an upper portion and a second inner diameter smaller than the first inner diameter at a lower portion, wherein the second inner diameter is smaller than the solid support so that the solid support is retained in the well above the lower portion.

52. The method of Claim 39, wherein the sample/collection container comprises a plurality of wells, each well having a bottom, an inner diameter adapted for receiving the solid support, and at least one protrusion extending

radially into the well for restricting the inner diameter of the well to prevent the solid support from dropping to the bottom of the well.

53. The method of Claim 52, wherein the at least one protrusion comprises a rib, ridge, ring or tab.

54. The method of Claim 39, wherein the centrifuge rotor operates at a plurality of speeds, and step (h) comprises rotating the centrifuge rotor at a first speed for cleaving the samples from the solid supports and at a higher second speed for transfer and/or concentration of a cleaved sample.

55. The method of Claim 54, wherein the first speed is selected to minimize creep.

56. The method of Claim 55, wherein the first speed is on the order of 20 to 30 r.p.m.

57. The method of Claim 54, wherein the second speed is selected to reduce bumping.

58. The method of Claim 57, wherein the second speed is on the order of 800 r.p.m.

59. The method of Claim 39, wherein the steps of dispensing comprise:

pumping a solution from a solution source into a reservoir;

pumping the solution from the reservoir through a plurality of tubes, wherein one tube corresponds to each dispensing tip of the plurality of dispensing tips.

60. The method of Claim 59, wherein further comprising measuring the amount of solution pumped into each tube.

61. The method of Claim 59, further comprising purging the plurality of tubes and plurality of dispensing tips with a gas after the solution has been dispensed.

62. The method of Claim 39, wherein the steps of dispensing further comprises, under computer control, detecting alignment of the dispensing head with the sample/collection container.

63. The method of Claim 39, wherein the sample is a chemical compound and the solution comprises a cleaving solution.

64. The method of Claim 39, wherein the sample is a biological sample containing DNA and the solution comprises a washing or eluting solution.

65. The method of Claim 64, wherein the sample/collection container comprises a separable assembly of a sample container and a collection container, and further comprising the step after step (i) of removing the collection container containing waste solution and replacing the collection

container with a clean collection container, and repeating steps (b) through (h) until purified DNA is transferred into the clean collection container.